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## References

**Goodman: On the exact variance of products**

**Goodman-1960**

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Leo A. Goodman. “On the exact variance of products”. In: *Journal of the American Statistical Association* 55.292 (Dec. 1960), pp. 708–713. DOI: [10.1080/01621459.1960.10483369](https://doi.org/10.1080/01621459.1960.10483369).

Abstract: A simple exact formula for the variance of the product of two random variables, say,  $x$  and  $y$ , is given as a function of the means and central product-moments of  $x$  and  $y$ . The usual approximate variance formula for  $xy$  is compared with this exact formula; e.g., we note, in the special case where  $x$  and  $y$  are independent, that the “variance” computed by the approximate formula is less than the exact variance, and that the accuracy of the approximation depends on the sum of the reciprocals of the squared coefficients of variation of  $x$  and  $y$ . The case where  $x$  and  $y$  need not be independent is also studied, and exact variance formulas are presented for several different “product estimates.” (The usefulness of exact formulas becomes apparent when the variances of these estimates are compared.) When  $x$  and  $y$  are independent, simple unbiased estimates of these exact variances are suggested; in the more general case, consistent estimates are presented.